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100 hours of their use. It had been very generally assumed that a glow-lamp was at its best, under fixed conditions of pressure, at the very beginning of its life and that it would deteriorate from that time on. The authors of this paper appear to have found, however, that this is not the case and that, on the contrary, the light is increased from the beginning through a certain considerable part of the life of the lamp, after which it slowly fails. One form in which this conclusion is put is that if a group of glow-lamps, such as were examined in this case, being the Edison-Swan Lamps, marked 100-8 and run at a pressure of 100 volts, be kept continuously in operation by putting in a new lamp of the same character whenever a filament breaks, and never replacing the lamps by new except for a broken filament, the light given out by the group will never be as small as at the beginning. Some reference is made to the probable cause of the rise in candle power by use, and the explanation given a year or two ago by Mr. Howell, at a meeting of the American Institute of Electrical Engineers, *i. e.*, that such a rise in candle power is due to an improvement of the vacuum of the lamp during the early part of its life, is commented upon. Some of the earlier examinations of the increase in candle power and improvement in vacuum by the authors of this paper seem decidedly to confirm this explanation by Mr. Howell; but subsequent tests, referred to in the addition to the paper made in January, 1895, are not so favorable to that hypothesis. The authors suggest that the rise in candle power may possibly have been due to a change in the surface of the filament causing the emissivity for heat to decrease, since that would raise the light emitted, as well as the number of candles per watt; but they declare that they have not yet discovered whether such change in heat-emissivity takes place. The methods of carrying on

the investigation, both electric and photometric, are explained in sufficient detail, and the whole is a valuable contribution to the subject.

T. C. M.

NOTES AND NEWS.

ENTOMOLOGY.

Dr. T. A. CHAPMAN has been publishing in the *Entomologists' Record* of London, and has now completed, a paper of no great length but of much importance, on the classification of butterflies, based on the structure of the pupæ, and a comparison of the same with the pupæ of the lower lepidopterous families. He places special emphasis on two points hitherto entirely neglected: The relative freedom of motion of the middle joints of the abdomen, and the relation of the parts on the head on dehiscence. His conclusions are that the *Papilionidæ* (excluding the *Pierinæ*) are the nearest relatives of the *Hesperidæ* (which agrees with all latest researches), but further that the *Lycænids* "should no longer be regarded as in any way intermediate between the *Papilionids* and *Nymphalids*; rather should the *Lemoniidæ* and *Lycænidæ* be regarded as a branch which developed from the *primæval* butterfly (above the *Hesperids*) in one direction, whilst the *Papilionids* arose and branched to the *Pierids* and *Nymphalids* quite independently. Another point is that the *Pierid* separated from the *Papilionid* at a very early stage of the evolution of the latter, and that the *Nymphalid* almost immediately thereafter separated from the *Pierid*." These conclusions are borne out by many facts in the structure of the other stages and especially render the position of the *Libytheinæ* less anomalous.

BRUNNER VON WATTENWYL has just published his *Monographie der Pseudophylliden*, the last large group of *Orthoptera* that has specially needed monographic treat-

ment. The group is essentially a tropical one, unknown in Europe and with only one species (as recognized by Brunner) in the United States—our true *Katydid*. Others will doubtless be found upon our southern borders, for in Mexico, Central America and the Antilles Brunner recognizes 34 genera and 73 species, the larger part of them new. The work, which is published in Vienna in 8°, contains descriptions of 434 species, divided among 122 genera, and is accompanied by a quarto atlas of ten plates.

A NEW QUADRUPLER EXPANSION ENGINE.

MESSRS. HALL AND TREAT announce, in the *Sibley Journal of Engineering* for April, 'A New Quadruple Expansion Engine.' This machine, built for regular working at 500 pounds pressure, and with its boiler, tested to 1300 pounds, has now been in operation in Sibley College, at Cornell University, for many months. It was designed by the authors of the paper, built by them in the shops of the College, and has since been tested under a great variety of conditions. The design was entirely original, although, of course, embodying the principles taught them in their college course, the one being a graduate of '93 and the other of '94, and both now candidates for advanced degrees, the one for a doctor's, the other for the master's, degree in engineering. The valve-gear is new and the invention of the builders of the engine. The proportions of the multiple-cylinder system are those derived by application of their text-book and lecture-room work; and the engine as a whole is a success. The boiler has worked well and economically up to above 600 pounds per square-inch, and its waste heat is utilized in the re-heating apparatus of the engine and so thoroughly as to make the temperature of the chimney very low. The steel for 'running parts' was obtained from the Bethlehem Iron Company and proves to be of very fine quality. Special devices

have been required, in every direction, to make the operation of the machine with such high-pressure steam 'satisfactory and safe. Even the injector was necessarily reconstructed, as no ordinary instrument would force water into the boiler against 600 pounds pressure. The figures reported for economy are something under *ten pounds of steam* per h. p. per hour, and the best conditions of operation are not yet fully identified, though unquestionably corresponding closely with the preliminary computations of the designers. This figure is the lowest yet reported, even for engines of many times the size of that here described. It will require authoritative revision and corroboration; but there seems no reason to doubt its substantial accuracy, as the result of many engine-trials under a great variety of conditions. If thus corroborated, it will stand as the 'record of the world' for the nineteenth century. The thermodynamic consumption of this engine should be about 7 pounds of steam per h. p. per hour, exclusive of all thermal wastes, and this should be approximated much more closely in engines of similar type built on a large scale. The figure attained is extraordinary, and almost incredible, for a model engine such as is described; yet it indicates a waste, by conduction and radiation, after all, of no less than twenty-five per cent. of all heat sent to the machine from its boiler.

PAPERS FOR THE MATHEMATICAL CONGRESS AT KAZÁN.

ON the occasion of the dedication of the Lobachévski monument at Kazán will be held a mathematical congress of a week's duration.

It is very much desired by the management that some papers may be contributed by Americans. As a complete program of the scientific communications to be made in the session will be issued this coming February, it is not too early to solicit Ameri-

can scientists to think of preparing something for this memorable occasion. Dr. G. B. Halsted has been asked by President Vasiliev to act for him in this matter, to correspond on questions of detail with any who hope to attend the Congress in person, to take charge of the communications of those who do not anticipate being present and to guarantee their proper presentation.

THE ROYAL GEOGRAPHICAL SOCIETY.

THE annual award of the honours of the Royal Geographical Society was made on May 14th, as follows: The Founders' medal to Dr. John Murray for his services to physical geography, and especially to oceanography during the last 23 years, and for his work on board the Challenger and as director of the Challenger Commission and editor of the Challenger publications since the death of Sir Wyville Thomson in 1882; the Patrons' medal to the Hon. George Curzon, M. P., (1) for his work on the history, geography, archæology, and politics of Persia, (2) for his subsequent journeys in French Indo-China, which have resulted in further publications of geographical as well as political and general value, and (3) for his journeys in 1894 to the Hindu Kush, the Pamirs and the Oxus, together with his visit to the Ameer of Afghanistan in Kabul; the Murchison grant was awarded to Mr. Eivind Astrup for his remarkable journey with Lieutenant Peary across the interior glacier to the northern shores of Greenland, and for his independent journey along the shores of Melville Bay, during which he laid down a portion of the northern part only previously seen at a great distance; the Back grant was awarded to Captain C. A. Larsen for the geographical and meteorological observations made by him during his Antarctic voyage in 1894; the Gill memorial was awarded to Captain J. W. Pringle, R.

E., for his share in the railway survey operations carried on under the direction of Captain Macdonald, R. E., in the country between the coast from Mombasa to the Victoria Lake; the Cuthbert Peek grant was awarded to Mr. G. F. Scott-Elliot for his explorations of Mount Ruwenzori and the region to the west of the Victoria Nyanza.—*London Times*.

THE NATIONAL GEOGRAPHIC SOCIETY.

THE National Geographic Society of Washington held its annual business meeting on May 31. Reports from the various officers bore witness to the increasing usefulness of the Society. When it was first organized, in 1888, there were but 205 members. Since then there has been a steady increase, the membership now numbering 1,193. A similar increase may be noticed in the number of public lectures delivered; sixty-two lectures having been given during the past winter, while in the winter of 1890 there were but eighteen.

Mr. Gardner G. Hubbard was reëlected President and Lieut. Everett Hayden Recording Secretary, and the following were elected Vice-Presidents: C. W. Dabney, Jr., Assistant Secretary of Agriculture; H. G. Ogden, Coast and Geodetic Survey; Gen. A. W. Greely, Chief Signal Service; C. Hart Merriam, Agricultural Department; W. W. Rockhill, Assistant Secretary of State, and Henry Gannet, Chief Topographer United States Geological Survey; Board of Managers, Marcus Baker, United States Geological Survey; G. K. Gilbert, Chief Geographer, United States Geological Survey; John Hyde, Statistical Expert, Agricultural Department; Prof. W. J. McGee, Bureau of Ethnology; F. H. Newell, Chief Hydrographer, United States Geological Survey; Prof. W. B. Powell and John R. Proctor; Treasurer, C. J. Bell; Recording Secretary, Everett Hayden; Corresponding Secretary, Miss E. R. Seidmore.

BOTANICAL BOOKS AT AUCTION.

AMONG the botanical books in the library of William B. Rudkin sold at auction in New York by Bangs & Co. were the following: H. Baillon's 'Natural History of Plants,' 7 vols., 8vo, brought \$15.87; Bentham and Hooker, 'Genera Plantarum,' London, 1862-83, \$17.25; Bentley and Trimen, 'Medicinal Plants,' 306 colored plates, London, 1880, \$34; Botanical Gazette, 13 vols., Madison, Wis., v. b., \$19.50; Charles Darwin's Works, a rare 'set' of 15 vols., 8vo, uniform green morocco, full gilt, \$41.25; D. C. Eaton, 'Ferns of North America,' colored plates by Emerton and Faxon, Salem, 1879, \$27; Elwes, J. H., 'Genus Lilium,' grand 4to, London, 1880, \$12.50; Emerson, 'Trees of Massachusetts,' 1878, \$8.50; John Gerarde, 'The Herball,' enlarged by Thomas Johnson, London, 1636, \$14.75; Goodale, 'Wild-flowers of America,' Boston, 1882, \$8.25; Lesquereux, 'Coal-Flora of Pennsylvania,' Harrisburg, 1880, \$10; J. C. Loudon, 'Arboretum Britannicum,' London, 1854, \$17; M. T. Masters, 'Vegetable Teratology,' London, 1869, \$8.25; Michaux and Nuttall, 'N. A. Sylva,' 277 colored engravings, 5 v., 8vo, embossed morocco, Philada., 1871, \$51.25; Parkinson, 'Theatrum Botanicum,' 4to, panelled calf, London, 1640, \$16.40; Ch. Pickering, 'Chronological History of Plants,' Boston, 1879, \$6; Powell, 'A Compleat History of Druggs,' London, 1725, \$5.50; Seeman, Berthold, 'Plants of the Fiji Islands,' 100 fine colored plates, London, 1865-73, \$20.50; Sowerby, 'English Botany,' colored figures by Sowerby, Fitch and others, 12 vols., 8vo, \$63; Torrey Botanical Club, various Bulletins, etc., 17 vols., \$26.35.

GENERAL.

At the monthly meeting of the trustees of the University of Pennsylvania the acting provost, Charles C. Harrison, made a donation of \$500,000 to the University, in honor

of his father, the late George L. Harrison, LL. D. Mr. Harrison stipulates that the fund shall be known as 'The George L. Harrison Foundation for the Encouragement of Liberal Studies and the Advancement of Knowledge.' The principal of this fund must be retained intact, the income alone to be used for the purposes of foundation. The following suggestions as to the use of the fund were made by the donor: 1 The establishment of scholarships and fellowships intended solely for men of exceptional ability. 2 The increasing the library of the University, particularly by the acquisition of works of permanent use and of lasting reference, to and by the scholar. 3 The temporary relief from routine work of professors of ability, in order that they may devote themselves to special work. 4 The securing men of distinction to lecture and, for a term, to reside at the University.

ACCORDING to an announcement from Macmillan & Co., the University Press of Columbia College will issue an *Atlas of Fertilization and Karyokinesis*, by Professor Edmund B. Wilson, with the coöperation of Dr. Edward Leaming. The work will contain forty figures, photographed from nature by Dr. Leaming from the preparations of Professor Wilson at an enlargement of one thousand diameters, and reproduced, without retouching or other alterations, by the gelatine process by Bierstadt, of New York. The photographs are very perfect and convey a good idea of the actual object. They illustrate nearly every important step in fertilization, from the first entrance of the spermatozoön onwards to the cleavage-stages, and not only present a very clear picture of the more familiar outlines of the subject, but embody many original discoveries as well. They are accompanied by an explanatory text, comprising a general elementary introduction, a critical description of the plates and a large number of text-cuts.

THE death is announced of Theodor Brorsen, at the age of seventy-six. He discovered at Kiel, on February 26, 1846, the small comet called by his name, which was found to have a period of about $5\frac{1}{2}$ years, and was observed at returns in 1857, 1868, 1873 and 1879, but has not since been seen, though a conjecture has been thrown out that it had some connexion with one discovered by Mr. Denning last year. Brorsen discovered another comet in 1846, a third in 1847, and two more in 1851.

DR. HUGH FRANCIS CLARKE CLEGHORN died at Straththie, in Fife, Scotland, on May 19th. He was appointed Professor of Botany in Madras University in 1852, and was an authority on Indian botany and arboriculture. While in Madras he organized a forest department, having for its object the preservation of tree life, and established an admirable system of management. Dr. Cleghorn returned to Scotland in 1869, filling temporarily the chair of Botany in Glasgow University. He was also president of the Royal Arboricultural Society and an active member of the Edinburgh Botanical Society.

At the commencement exercises of Stanford University, President Jordan stated that Mrs. Stanford had been spending \$1,000 a day of her private fortune to maintain the University. In case Mrs. Stanford's fortune should be exhausted before the decision of the Courts in regard to the Stanford estate had been reached, it would be necessary to close the University.

JOHN PAUL PAULISON died at Tenafly, New Jersey, on May 30th. Mr. Paulison was interested in astronomy and owned a private observatory.

PROFESSOR J. J. STEVENSON, of the University of the City of New York, will spend the summer in the coal fields of Arkansas, Indian Territory and Texas, with incidental studies in New Mexico and Colorado.

DR. ADOLF ELSASS, Professor of Physics in the University of Marburg, died on May 12th, at the age of forty years.

THE June issue of the Amherst Literary Monthly will be a special memorial number devoted to President Seelye.

THE Royal Natural History, edited by Richard Lydekker (reviewed in SCIENCE, April 5, p. 387) is being published in America by Frederick Warne & Co. It will be issued in thirty-six fortnightly numbers and will be completed at the same time as the English edition.

DR. D. K. PEARSON has offered \$50,000 to Mount Holyoke College if an additional \$150,000 can be raised. It is said that Dr. Pearson has already given \$2,000,000 to various colleges.

HAROLD WHITING, Professor of Physics in the University of California, was among those lost in the submergence of the steamship Colima.

At the May meeting of the Victoria Institute, London, the subject of 'Early Man' was considered. In dealing with it the evidence for the existence of a 'missing link' was first examined, the subject being introduced in a paper by Professor E. Hull, late Director-General of the Geological Survey of Ireland. In dealing with it he reviewed all the known instances of so-called 'missing links,' including that discovered by Dr. Dubois in Java, and concluded that none could be regarded as in fact 'a missing link.' After this the question of the earliest man was discussed in a paper by Sir William Dawson, in which he described the physical character and affinities of the Gaunches, an extinct race in the Canary Islands.

MR. W. W. ROCKHILL, Assistant Secretary of State, who has been appointed by the State Department a delegate to the International Geographical Congress, meeting in London this summer, will join with a

delegation from the National Geographic Society in an effort to persuade the Congress to hold its next meeting in Washington.

THE death is announced of Dr. Franz Neumann, the oldest active teacher in Germany. In 1826 he was called to the Professorship of Physics and Mineralogy in the University of Königsberg, and for sixty-nine years has been teaching and working in the same institution. Dr. Neumann was the first man in Germany to teach Mathematical Physics.

IT is stated that Professor E. E. Barnard and Professor Burnham have accepted positions in the Yerkes Observatory, Chicago.

PRINCIPAL PETERSON, who has accepted the Principalship of McGill University, in succession to Sir William Dawson, graduated at Edinburgh University in 1875, and afterwards gained an open scholarship at Corpus Christi College, Oxford. For two and a half years he acted as assistant to the Professor of Humanity in Edinburgh University. On the inauguration of University College, Dundee, in 1882, Mr. Peterson was unanimously appointed Principal and Professor of Classics and Ancient History.

MAJOR WILLIAM A. SHEPARD, for twenty-five years Professor of Chemistry in Randolph Macon College, died in Ashland, Va., on June 3d.

A STATUE of the late Professor Billroth was unveiled in the Hospital Rudolfinerhaus on April 25th.

SOCIETIES AND ACADEMIES.

GEOLOGICAL SOCIETY OF WASHINGTON.

THE following are abstracts of the communications presented at the thirty-fourth meeting, May 8, 1895 :

G. F. BECKER. 'Gold Fields of the Southern Appalachians.' This communication presented a summary of a report upon

these gold fields, based upon field work of the last season, which will appear in the Sixteenth Annual Report of the Director of the U. S. Geological Survey, and will be issued in separate form very soon.

The geographical position, history and statistics of the known deposits were first given, followed by a discussion of the rock formations and the structural features of the regions in which the deposits occur. The gold-bearing veins and impregnations were then described, and a long list of the observed gangue minerals was given, with comments upon their significance. The secondary, or placer deposits, were also considered.

C. WILLARD HAYES. 'Notes on the Geology of the Cartersville Sheet, Georgia.' The region covered by the Cartersville sheet is in northwest Georgia, its northern and western borders being about thirty miles respectively from the Tennessee and Alabama lines. Its topography is dominated by two peneplains, the older preserved by the harder metamorphic and crystalline rocks on the eastern side of the sheet, and the younger developed on comparatively soft limestones and shales. The older peneplain shows a decided southward inclination from an altitude of 1,400 feet at the north edge of the sheet to 1,000 at the south edge. Above the peneplain rise a few monadnocks from 800 to 1,000 feet, while the larger streams have cut their channels several hundred feet deep within it. The lower peneplain has an altitude of between 800 and 900 feet, and a slight inclination toward the west. The two plains probably coincide a short distance east of this region, in the vicinity of Atlanta.

Two distinct groups of rocks are found in this sheet, separated by a profound fault. The rocks west of the fault are unaltered Cambrian and Silurian, while those to the east are crystalline and metamorphic, probably Archean and Algonkian. The most